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FISH & RICHARDSON PC  
225 FRANKLIN ST  
BOSTON, MA 02110

EXAMINER
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GRAHAM, ANDREW R

ART UNIT	PAPER NUMBER
2644	

DATE MAILED: 07/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/735,123

Applicant(s)

AYLWARD ET AL.

Examiner

Andrew Graham

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 April 2004.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-23 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-23 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07/11/2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

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**DETAILED ACTION**

***Drawings***

1. The proposed drawing corrections were received on April 24, 2004. These drawing corrections are approved by the examiner. New corrected drawings that include this amendment are now required in this application.

***Specification***

2. The amendment to the specification is noted, and the previous relevant objection to the specification is hereby withdrawn.

***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. **Claims 1-23** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s),

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at the time the application was filed, had possession of the claimed invention.

Claims 1, 11, and 14 each include the limitations of "said shifting is constant" or "shifting by a constant phase angle". The examiner respectfully submits that the scope associated with such wording of a limitation is new matter. This "constant" shifting is interpreted herein to mean that, over the given frequency range, the amount of phase shift does not change based on the frequency. This is based in part by the fact that the applicant argues that the previously applied reference, Robinson, does not teach such a "substantially constant phase shift", citing Figure 2, and col. 4, lines 35-41. The phase shift in the reference of Robinson, illustrated by line 52 in Figure 2, varies by only 10° over the frequency range of 20-5000 Hz. Thus, to argue that this phase shift is not "substantially constant" would mean that the scope of the applicant's phase shift is less than 10°, or 0°, as is denoted by the word "constant". It is further noted that "substantially constant" listed in the remarks, is considered herein to be different in scope than "constant". This "constant" phase shifting does not appear to be supported by the specification. Specifically, the paragraph of the specification that begins at the bottom of page 5 and continues to the top of page 6 states that "the phase shift is preferably 60 to 120 degrees over the frequency range of interest" and it is desirable "to have most in the frequency range relatively shifted by close to 90 degrees". These phrases are not interpreted to mean an

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exact, invariant angular degree, but rather, an angular degree that varies over the given frequencies. The discrepancy is further illustrated by Figures 5a and 8b of the present application, both of which show a phase shift that changes depending on frequency. The applicant is respectfully requested to delete this limitation from the cited claims or amend the limitation such that it corresponds to the scope supported by the specification.

**Claims 2-10, 12-13, and 15-23** are rejected due to their respective dependencies upon rejected claims.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. **Claims 1-17, 20, and 22-23** are rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson (USPN 4356349) in view of Griesinger (USPN 6683962) and Waller, Jr (USPN 5333201). "Waller, Jr" will hereafter be referred to as "Waller".

Robinson discloses a method and apparatus for enhancing a stereo signal. Such a system, as illustrated in Figure 1A,

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involves the modification of two different input signals on two input lines (20,24) (col. 4, lines 1-4). These two signals, derived initially from stereo audio signals, read on "a first audio signal from a first audio channel and a second audio signal from a second audio channel" (col. 3, lines 58-61).

Specifically, the sum signal (20) is equated herein to "a first audio signal from a first audio channel" and the difference signal (line 24) is equated to "a second signal from a second audio channel" (col. 4, lines 1-4). The modifier network (30) for one of the signals introduces a small time delay to the low frequency component of the signal, which in terms of sinusoidal signals is equivalent to a phase shift (col. 4, lines 11-17).

Robinson discusses the signal in terms of various frequency ranges, including 30 to 250 Hz, and higher than 250 Hz (col. 4, lines 36-40). This reads on "said first and second audio signals having a first and second frequency range". The result of this phase shifting is shown in Figure 2 as curve 52 (col. 4, lines 34-36). This modification of the particular frequency range between two low levels of frequency shift reads on "shifting the phase of said of said first audio signal relative to said second audio signal". As can be seen in Figure 2, this phase shift is relatively minor, the shown values varying from  $2^{\circ}$  to a maximum of  $9^{\circ}$  (col. 4, lines 36-40). In view of the definition of "constant" discussed above, this reads on "said shifting is constant". After modification, the two signals are combined with a summing network (34), which reads on "combining the audio

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signal from said first channel with the audio signal from the second channel".

However, Robinson does not specify:

- that the frequency range over which the relative phase is applied is from about 20 Hz to about 500 Hz
- that the combined bass frequency signal with a range of phase shifting being between about 60 degrees and about 120 degrees

Griesinger teaches a system of signal processing for providing a richer, fuller bass sound by exciting more room modes than conventional systems. Griesinger teaches that the spaciousness of an audio signal below 500 Hz is more complicated than in higher frequencies, and that the maximum spaciousness is obtained with the excitation of all resonance modes in a listening area (col. 8, lines 42-55; col. 9, lines 50-61; col. 15, lines 5-16). A relative phase shift of approximately  $90^\circ$  is disclosed as the solution for maximally exciting all room modes (col. 15, lines 43-45 and col. 16, lines 41-49). Griesinger teaches that constant phase shifting networks are well known in the art, and are generally arranged to approximate a  $90^\circ$  phase shift over a given range of frequencies, such as 20-200 Hz (col. 15, lines 17-23). Griesinger also teaches that, ideally, the phase shift is zero above  $400^\circ$  (col. 15, lines 26-27). Figure 15 illustrates circuitry used in implementing such a phase shift (col. 15, lines 46-48). Curve B of Figure 16 illustrates the

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phase relationship that results from a simulation of the output of such circuitry. The shown shift is within  $14^\circ$  of  $90^\circ$  from 150 Hz to 200 Hz, at approximately  $45^\circ$  at 300 Hz,  $30^\circ$  at 500 Hz, and  $20^\circ$  at 1000 Hz. The disclosure of a nearly constant phase shift over a decade of "20 Hz and 200 Hz" equates to "said shifting is constant and substantially limited to said first frequency range from about 20 Hz to about 500 Hz", though it is noted that other frequency ranges associated with the simulation of Figure 16 may be interpreted as "about 20 Hz" and "about 500 Hz". The phase shift of within  $14^\circ$  of  $90^\circ$  for the simulation of Figure 16 and the other phase shift ranges shown in Figure 16 for the ranges discussed above reads on "with the range of phase shifting being between about 60 degrees and about 120 degrees".

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to incorporate the phase shifts disclosed by Griesinger as the phase shifts applied by the system of Robinson. The motivation behind such a modification would have been that such phase shifts would have increased the apparent spaciousness of sounds reproduced in a room by the speakers, based on the excitation of all modes of the room and the corresponding creation of an interaural time difference. A boost stage is also included in the system for equalizing the output response for the low frequencies.

The satellite/subwoofer (5,6,8,9) speaker system of Griesinger suggests that a bass frequency portion of the



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processed signal is desirable (col. 4, lines 56-61). However, neither Robinson nor disclose a method for deriving such a signal.

Robinson in view of Griesinger does not clearly specify:

- that the combining of the relatively phase shifted audio signals produces a combined bass frequency signal, wherein the term "bass frequency signal" is interpreted to only include signals from the bass frequency range

Waller discloses a system that derives improved sound directionality. This is accomplished through the isolation of various frequency ranges of the received signal and the appropriate adjustment of their output characteristics, such as amplitude (col. 5, lines 25-34; col. 6, lines 28-43). Figure 1 illustrates an embodiment of the system wherein high pass filters (21,31) and low pass filters (22,32) are used to separate the received signal into two frequency ranges, wherein the high frequency range component is altered with an in-path voltage controlled amplifier (col. 6, lines 28-48). The two low pass filtered signals are provided directly to a pair of summing amplifiers (40R,40L), an alternate embodiment of which is shown in Figure 6 (col. 9, lines 55-57). Figure 6 illustrates the use of all-pass filters, which are also used in the system of Griesinger (col. 9, lines 23-27). Figure 3 illustrates an embodiment wherein the middle frequency ranges are also isolated, and each frequency band may be adjusted with a voltage-controlled

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amplifier (34-39) (col. 12, lines 25-37). The combination of the low pass filtered components of the two signals, in view of the similar summation of signals in Robinson and the requirements of the subwoofers of Griesinger, equates to "to provide a combined bass frequency signal". The resulting signal, again, in view of the teachings of Griesinger, reads on "electroacoustically transducing the combined signal". The teachings of Robinson and Griesinger, disclose the concept of relatively phase shifting this low pass filtered signal, as is discussed in more detail above.

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the low-pass filters in the manner and location taught by Waller into the system of Robinson in view of Griesinger. The motivation behind such a modification would have been that such filters would have provided the sub-woofers of the dual speaker arrangement of the system of Griesinger with a signal including the proper frequency ranges. Such filters would have also enabled frequency range specific signals adjustments to be performed, and be performed to more than one particular frequency range, which parallels the equalization taught by Griesinger.

Regarding **Claim 2**, the time delay of Robinson is applied to the low frequency range of the processed signal, which reads on "said first frequency range is the bass frequency range". Griesinger also teaches that the phase shift is ideally zero

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above 400 Hz, which also equates to the bass frequency range (col. 15, lines 27-28).

Regarding **Claim 3**, the input in Robinson to each of the modifying circuits is derived from the combination of stereo input signals. The upper input signal line (20) shown in Figure 1A receives a summation of two copies of the input stereo signal from a summing network (18) (col. 4, lines 1-4). The forming of this signal on the connection wire (20) reads on "downmixing a third channel and a fourth channel to produce a one of said first channel or said second channel".

Regarding **Claim 4**, similar to the means discussed in regards to Claim 5, the signal provided on connection line (24) is formed through the subtraction of two copies of an input stereo signal with a difference network (22) (col. 4, lines 1-4 of Robinson). The forming of this signal, based on a copy of the stereo input signal reads on "the step of downmixing a fifth channel and a sixth channel to produce the other of said first channel or said second channel".

Regarding **Claim 5**, please refer to the like teachings of Claim 3. Regarding **Claim 6**, please refer to the like teachings of Claim 4.

Regarding **Claim 7**, Griesinger discloses that all-pass filters are able to provide a nearly constant phase shift in a single decade of frequencies, such as 20Hz to 200 Hz (col. 15, lines 20-23). The concept of performing the phase shift over a particular range of frequencies equates to "selected so that said

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relative shifting occurs only over said first frequency range". Figure 15 illustrates a pair of phase shifters being used on two signal lines (col. 15, lines 29-45). This reads on "a circuit including a first all-pass filter, filtering said audio signal from said first audio channel" and "a circuit including a second all-pass filter".

Regarding **Claim 8**, Griesinger teaches that boost stages are utilized in the signal paths to equalize the low and high frequency responses of the output in order to flatten the output response (col. 15, lines 57-65). The gain applied is approximately 3 db for the low frequency range, and 0 db for the high frequency range (col. 15, lines 62-65). In the system of Robinson, the adjustments to the signal level are applied by a dual channel amplifier (42) before the signal is applied to output speakers (44,46) (col. 4, lines 23-25). The boost applied in the system of Griesinger, in view of the subwoofers of Griesinger and the amplifier placement of Robinson, reads on "adjusting the frequency response of the path carrying the combined audio signals".

Regarding **Claim 9**, the applied signal boost is specifically described by Griesinger as being equalization, which reads on "said adjusting includes equalizing said combined audio signal" (col. 15, lines 57-65).

Regarding **Claim 10**, the teachings of Waller include dual low pass filters (22,32), wherein the addition of these two signals involves only the low frequency components of the signals

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(col. 6, lines 30-32 and 44-48; col. 9, lines 55-57). This summation, in view of the subwoofers of Griesinger, which would have only required the low frequency component of a signal, equates to "said combining combines only the spectral components in said first frequency range".

Regarding **Claim 11**, please refer above to the rejection of the parallel limitations of Claim 1. Regarding **Claim 12**, please refer above to the rejection of the parallel limitations of Claim 2, noting that the time delay is applied to the low frequency portion of the signal, and not the other frequency ranges, which reads on "to maintain the phase of said first channel signal relative to said second channel signal unchanged over a second range" (col. 15, lines 27-28 of Griesinger). Regarding **Claim 13**, please refer to the like teachings of Claim 2, again noting that the time delay is applied to the low frequency part of the signal. Regarding **Claim 14**, please refer to the like teachings of Claim 1. Regarding **Claim 15**, please refer to the like teachings of Claim 7. Regarding **Claim 16**, please refer to the like teachings of Claim 7. Regarding **Claim 17**, please refer to the like teachings of Claim 2.

Regarding **Claim 20**, Waller discloses the use of two low pass filters (22,32) for filtering the two signals in the two derived signal paths (col. 6, lines 28-30 and 44-48). These filters equate to "a first low-pass filter for filtering said first audio signal and a second low pass filter for filtering

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said second audio signal". The combination of these two specific signals in the adders of Waller, in view of the requirement of the subwoofer speaker of Griesinger, read on "so that said combiner combines only the bass portions of said first audio signal and said second audio signal".

Regarding **Claim 22**, please refer to the like teachings of Claim 3. Regarding **Claim 23**, please refer to the like teachings of Claim 1.

5. **Claim 21** is rejected under 35 U.S.C. 103(a) as being unpatentable over Robinson in view of Griesinger and Waller, as applied above, and in further view of Kuusama et al (USPN 6332026). Hereafter, "Kuusama et al" will simply be referred to as "Kuusama".

As detailed above, Robinson discloses circuitry for improving the low frequency output of a stereo speaker system, in which the improvement involves the phase shifting of one processed signal in regards to another. Griesinger specifies desired frequency shifts for corresponding frequency ranges that improves the apparent speciousness of a low frequency portion of an audio signal. Griesinger discloses a particular speaker arrangement that utilizes subwoofers, which would have only required the low frequency component of a signal for output. Waller discloses the use of low pass filters for isolating the low frequency component of an audio signal for processing.

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Robinson in view of Griesinger and Waller does not specify:

- a low pass filter that filters the output of the combiner for providing only the bass component of the combined signal

Kuusama discloses a system for deriving a low frequency effect audio signal. Such a system involves the low pass filtering of a combination of the surround input signals, and combining the filtered signal with a subwoofer signal, and then providing the modified signal as output or for use in combination with other channel signals (col. 4, lines 64-67 and col. 5, lines 1-16). The combined signal in the system of Kuusama is low pass filtered (9), which reads on "a low pass filter for filtering the output signal of said combiner to provide only the bass portion of said combined signal" (col. 5, lines 5-8).

To one of ordinary skill in the art at the time the invention was made, it would have been obvious to include the low pass filter in the manner of Kuusama into the system of Robinson in view of Griesinger and Waller. The motivation behind such a modification would have been that such a filter would have ensured that the appropriate frequency range of a signal applied to a subwoofer. Such a filter would have provided an alternative manner of filtering to that taught by Waller, or would have redundantly ensured that the output signal contains the proper frequency range.

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***Allowable Subject Matter***

Claims 18 and 19 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

While the prior art of record teaches the general physical structure of the Claims 18 and 19, Claim 18 is considered allowable over the prior art of record because the Examiner found neither prior art cited in its entirety, nor based on the prior art, found any motivation to combine any of said prior art to arrive at a frequency spacing between a pair of in-path all-pass filters that is approximately a factor of 16, wherein the limitation of "approximately 16" is interpreted to be  $16 \pm 0.0035$  as is supported by the applicant's disclosure, and when such a limitation is considered in combination with each of the other limitations, including the physical structure, recited in Claims 14, 15, and 18. Claim 19 is considered allowable for reasons parallel to those cited above for Claim 18, wherein "between 3 and 5" is associated with 4 and 4.5 as is supported by the specification.



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***Response to Arguments***

Applicant's arguments with respect to claims 1-23 have been considered but are moot in view of the new ground(s) of rejection.

***Conclusion***

**THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew Graham whose telephone number is (703) 308-6729. The examiner can normally be reached on Monday-Friday (7:30-4:30), excluding alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bill Isen, can be

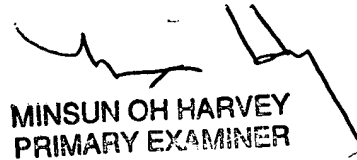
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reached at (703) 305-4386. The fax number for the organization where this application or proceeding is assigned is 703-872-9314 for regular communications, and 703-872-9315 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-3900.

AG  
Andrew Graham  
Examiner  
A.U. 2644

ag  
July 7, 2004

  
MINSUN OH HARVEY  
PRIMARY EXAMINER